



IFW  
PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants: Geyer, et al.

Serial No.: 10/574,378

Filed: April 03, 2006

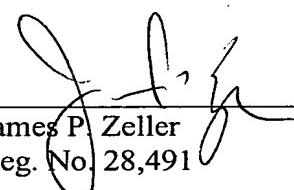
For: Serial Circuit of Solar Cells with  
Integrated Semiconductor Bodies,  
Corresponding Method for Production  
and Module with Serial Connection

Group Art Unit: To be assigned

Examiner: To be assigned

) I hereby certify that this paper (or fee) is being  
deposited with the United States Postal  
Service, first class postage prepaid, addressed  
to: Commissioner for Patents, P.O. Box 1450,  
Alexandria, VA 22313-1450

September 25, 2006

  
James P. Zeller  
Reg. No. 28,491

**SUBMISSION OF TRANSLATION INTERNATIONAL REPORT  
ON PATENTABILITY**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

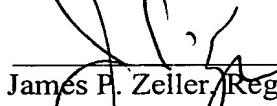
Sir:

Submitted herewith is an English translation of the international preliminary report on  
patentability.

Respectfully submitted,

MARSHALL, GERSTEIN & BORUN LLP

By:

  
James P. Zeller, Reg. No. 28,491  
Attorney for Applicant  
6300 Sears Tower  
233 S. Wacker Drive  
Chicago, Illinois 60606-6357  
(312) 474-6300

September 25, 2006

**PATENT COOPERATION TREATY**  
**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
 (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>10009-PT-WO</b>	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. <b>PCT/EP2004/010781</b>	International filing date (day/month/year) <b>24.09.2004</b>	Priority date (day/month/year) <b>02.10.2003</b>
International Patent Classification (IPC) or national classification and IPC <b>H01L31/0352, H01L31/042, H01L31/05</b>		
Applicant <b>SCHEUTEN GLASGROEP</b>		

<ol style="list-style-type: none"> <li>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</li> <li>2. This REPORT consists of a total of <u>8</u> sheets, including this cover sheet.</li> <li>3. This report is also accompanied by ANNEXES, comprising:                     <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>15</u> sheets, as follows:                             <table border="0" style="width: 100%;"> <tr> <td style="width: 15px;"><input checked="" type="checkbox"/></td> <td>sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</td> </tr> <tr> <td><input type="checkbox"/></td> <td>sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</td> </tr> </table> </li> <li>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</li> </ol> </li> </ol>	<input checked="" type="checkbox"/>	sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).	<input type="checkbox"/>	sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.												
<input checked="" type="checkbox"/>	sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).															
<input type="checkbox"/>	sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.															
<ol style="list-style-type: none"> <li>4. This report contains indications relating to the following items:                     <table border="0" style="width: 100%;"> <tr> <td style="width: 15px;"><input checked="" type="checkbox"/></td> <td>Box No. I Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII Certain defects in the international application</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. VIII Certain observations on the international application</td> </tr> </table> </li> </ol>	<input checked="" type="checkbox"/>	Box No. I Basis of the report	<input type="checkbox"/>	Box No. II Priority	<input type="checkbox"/>	Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI Certain documents cited	<input type="checkbox"/>	Box No. VII Certain defects in the international application	<input checked="" type="checkbox"/>	Box No. VIII Certain observations on the international application
<input checked="" type="checkbox"/>	Box No. I Basis of the report															
<input type="checkbox"/>	Box No. II Priority															
<input type="checkbox"/>	Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability															
<input type="checkbox"/>	Box No. IV Lack of unity of invention															
<input checked="" type="checkbox"/>	Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement															
<input type="checkbox"/>	Box No. VI Certain documents cited															
<input type="checkbox"/>	Box No. VII Certain defects in the international application															
<input checked="" type="checkbox"/>	Box No. VIII Certain observations on the international application															

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/EP	Authorized officer
Faxsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/010781

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- This report is based on translations from the original language into the following language \_\_\_\_\_ which is the language of a translation furnished for the purposes of:
- international search (Rule 12.3 and 23.1(b))
  - publication of the international application (Rule 12.4)
  - international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

- the international application as originally filed/furnished  
 the description:

pages 1, 4-17 as originally filed/furnished  
 pages\* 2, 2a, 2b, 3 received by this Authority on 26.07.2005 with telefax

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

- the claims:

nos. \_\_\_\_\_ as originally filed/furnished

nos.\* \_\_\_\_\_ as amended (together with any statement) under Article 19

nos.\* 1-38 received by this Authority on 03.02.2006 with telefax

nos.\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

- the drawings:

sheets 1/3-3/3 as originally filed/furnished

sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

- a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3.  The amendments have resulted in the cancellation of:

- the description, pages \_\_\_\_\_
- the claims, nos. \_\_\_\_\_
- the drawings, sheets/figs \_\_\_\_\_
- the sequence listing (specify): \_\_\_\_\_
- any table(s) related to sequence listing (specify): \_\_\_\_\_

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, pages \_\_\_\_\_
- the claims, nos. \_\_\_\_\_
- the drawings, sheets/figs \_\_\_\_\_
- the sequence listing (specify): \_\_\_\_\_
- any table(s) related to sequence listing (specify): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/010781

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability:  
citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Claims	1-38	YES
	Claims		NO
Inventive step (IS)	Claims	1-38	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-38	YES
	Claims		NO

**2. Citations and explanations (Rule 70.7)**

1.) This report makes reference to the following document(s) :

D1: US-A-4407320 (LEVINE JULES D) 4 October  
1983

D2: EP-A-940860 (NAKATA JOSUKE) 8 September  
1999

2.) The present application meets the requirements of PCT Article 33(2) and (3) because the subject matter of independent claims 1 and 16 is novel and inventive.

D1 is regarded as the prior art closest to the subject matter of claim 1.

It discloses a method for producing a series interconnection of solar cells with semiconductor bodies, having the following features:

introducing one or more conductive bodies into an insulating carrier layer according to a pattern, the conductive bodies protruding from the surface of the

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/010781

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

carrier layer at least on one side thereof (see D1, figure 1, reference sign 111), and the pattern providing at least one dividing line for the width B, which is formed by one or more conductive bodies (see D1, column 3, lines 17-26; figure 1),

introducing several spherical or grain-like semiconductor bodies into the insulating carrier layer according to a pattern, the semiconductor bodies consisting of Si substrate cores and protruding from the surface of the carrier layer on at least one side thereof (see D1, figure 1, reference sign 110; column 3, lines 4-13), and the pattern providing that the areas adjacent to or between several dividing lines made of conductive bodies are fitted with semiconductor bodies (see D1, figure 1);

removing parts of the semiconductor bodies on one side of the carrier layer (see D1, figure 3b);

applying a conductive back contact layer to the side of the carrier layer on which parts of the semiconductor bodies were removed (see D1; figures 4a and 4b; column 3, lines 57-59);

applying a conductive front contact layer to the side of the carrier layer on which no semiconductor bodies were removed (see D1; figure 4a; column 3, lines 54-56 and 61-63);

introducing at least two separating sections along a

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/010781

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

dividing line made up of conductive bodies, a first separating section being introduced into the front contact layer and a second separating section being introduced into the back contact layer, the separating sections being disposed on different sides of said dividing line, and the separating sections penetrating through the back contact layer all the way to the carrier layer (see D1; figure 1; column 4, lines 33-41).

Therefore, the subject matter of claim 1 differs from the method known from D1 in that the semiconductor bodies consist of substrate cores coated with at least one conductive back contact layer of molybdenum and a semiconductor layer arranged thereabove and consisting of a I-III-VI compound semiconductor, in that before and/or after the deposition of the front contact layer and/or the back contact layer, a buffer layer of CdS and/or a layer of intrinsic ZnO have already been deposited on the semiconductor bodies, and in that when parts of the semiconductor bodies are removed, the back contact layer is exposed.

Therefore, the subject matter of claim 1 is novel (PCT Article 33(2)).

To a person skilled in the art, the new technical features are not rendered obvious by D1, since D1 contains nothing that suggests this type of structure for the semiconductor bodies.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/010781

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

D2 describes a semiconductor body having a dielectric substrate core, a conductive back contact layer, and a CuInSe<sub>x</sub> semiconductor layer. Neither the other features of the semiconductor body nor the specific method for producing a series interconnection according to claim 1 of the application are described or mentioned in D2.

Therefore, the subject matter of claim 1 cannot be regarded as an obvious combination of the teachings of D1 and D2.

Consequently, the subject matter of claim 1 is also regarded as inventive (PCT Article 33(3)).

Using a similar line of reasoning, it can be concluded that the subject matter of independent claim 16, the subject matter of which is a series interconnection of solar cells with semiconductor bodies, can be regarded as novel and inventive (PCT Article 33(2) and (3)).

3.) Claims 2-15 are dependent on claim 1 and therefore likewise meet the PCT requirements for novelty and inventive step.

Claims 17-37 are directly or indirectly dependent on claim 16 and therefore likewise meet the PCT requirements for novelty and inventive step.

4.) The photovoltaic module in claim 38 comprises a series interconnection of solar cells according to

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

International application No.

PCT/EP2004/010781

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability:  
citations and explanations supporting such statement**

claims 16-37 and is therefore likewise regarded as novel and inventive (PCT Article 33(2) and (3)).

5.) The subject matter of claims 1-38 meets the requirements of PCT Article 33(4) because it is industrially applicable.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/010781

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

1.) The subject matter of claims 1, 7, 16 and 33 does not meet the requirements of PCT Article 6 because it lacks clarity.

Claims 1 (method) and 16 (product) claim the series interconnection of solar cells. It is not clear to a person skilled in the art, however, how the series interconnected solar cells can be formed from the spherical semiconductor bodies. The claims do not clearly define the individual solar cells, and therefore the definition of the subject matter of these claims lacks clarity (PCT Article 6).

In claim 7, the term "auxiliary agent" is vague and unclear and leaves the reader uncertain as to the meaning of the technical features in question. As a result, the definition of the subject matter of this claim lacks clarity (PCT Article 6).

In claim 33, the term "strip-like" applied to the series interconnection is vague and unclear and leaves the reader uncertain as to the meaning of the technical features in question. Apparently, the term refers to the specific shape of the carrier layer. As a result, the definition of the subject matter of this claim lacks clarity (PCT Article 6).